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| 10/028,067 | 12/21/2001 | Tong Shi | S01.12-0860/STL 10458 | 2905 |

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| EXAMINER | |
|---|---|
| RODRIGUEZ, GLENDA P | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2651 | |

DATE MAILED: 08/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/028,067 | SHI, TONG | |
| | Examiner | Art Unit | |
| | Glenda P. Rodriguez | 2651 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *06 June 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-3,5,7-22 and 25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *14* is/are allowed.

6)☒ Claim(s) *1-3,5,7-12,15-18,20-22 and 25* is/are rejected.

7)☒ Claim(s) *13 and 19* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *6/6/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugawara et al. (US Patent No. 6, 501, 610) in view of Bliss et al. (US Patent No. 6, 216, 249).

Regarding Claim 1, Sugawara et al. teaches a method of identifying an equalization target for a channel, the method comprising:

Measuring a goodness metric for a first candidate target by reading data through the channel (Col. 2, L. 25-40, wherein it teaches two different targets being received in the readback channel. Sugawara et al. Further teaches that the ACS circuit compares the metric values of each of the target values in Col. 5, L. 4-31.);

Measuring the goodness metric for a second candidate target by reading data through the channel (Col. 2, L. 25-40, wherein it teaches two different targets being received in the readback channel. Sugawara et al. Further teaches that the ACS circuit compares the metric values of each of the target values in Col. 5, L. 4-31.);

And comparing the measure of the goodness metric of the first candidate target to the measure of the goodness metric of the second candidate target and selecting the target with the better measure of the goodness metric as the equalization target

for the channel (Col. 5, L. 4-31, wherein Sugawara et al. teaches the use of a ACS wherein two metric targets (one from a PR4 signal and another from the EPR4 signal) and selects by comparison the smallest or best metric as the detected target for the channel. See also Page 6, L. 13-25 of the Applicant's Specification, wherein it teaches the comparison and selection technique.).

However, Sugawara et al. does not explicitly teach wherein the selected equalization target is modified. Bliss et al. teaches wherein the chosen surviving branch metric (i.e. goodness metric) is chosen and all the memories are modified to that surviving branch metric for further trellis detection (Col. 7, L. 6-65 of Bliss et al.). It would have been obvious to a person of ordinary skill in the art, at the time the invention was made, in order to modify Sugawara et al.'s invention with the teaching of Bliss et al. in order to minimize power dissipation when calculating surviving branch metrics.

Regarding Claim 2, the combination of Sugawara et al. and Bliss et al. teach all the limitations of Claim 1. Sugawara et al. further teach wherein setting the first candidate target in the channel (it is inherent that in a reading operation the data is "set" in the channel.); placing an equalizer in the channel into adaptation mode until the equalizer adapts itself to produce equalized data that approaches the first candidate target (See Fig. 3, wherein it teaches a read back signal is placed in a first equalizer 5a.); taking the equalizer out of adaptation mode (Col. 5, L. 14- 31, wherein Sugawara et al. teaches that the equalizer is adapted to the channel read back channel. See also Col. 9, L. 10-25 of Sugawara et al. wherein it teaches the modification of the tap coefficients in the medium in order to adapt to the chosen target.); using the equalizer to form equalized data (See Fig. 3, wherein it teaches the read back signal having the equalizer 5a or 5b

that equalizes the signal.); and measuring the goodness metric based in part on the equalized data (Col. 5, L. 14-31).

Regarding Claim 3, the combination of Sugawara et al. and Bliss et al. teach all the limitations of Claim 2. Sugawara et al. further teaches performing post-processing on the equalized data to form post-processing data; and measuring the number of parity errors in the post-processing data (Col. 2, L. 49-65 and Col. 5, L. 14-31, Sugawara et al. teaches an ACS circuit in which it compares the equalized and processed data from the two target data in order to select the one with smallest error.).

3. Claims 5 and 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugawara et al. and Bliss et al. as applied to claim 1 above, and further in view of Sawaguchi et al. (US Patent No. 5, 539, 588).

Regarding Claim 5, the combination of Sugawara et al. and Bliss et al. teach all the limitations of Claim 1. Sugawara et al. does not explicitly teach wherein the first candidate target and the second candidate target are constrained to have a spectral null. However, Sawaguchi et al. teaches wherein the first candidate target and the second candidate target are constrained to have a spectral null (Col. 3, L. 34-52. Sawaguchi et al. teach a magnetic recording/reproducing apparatus in which it selects the next to the lowest spectral null constraint.). It would have been obvious to a person of ordinary skill in the art, at the time the invention was made, to modify Sugawara et al.'s invention with the teaching of Sawaguchi et al. in order to improve the frequency characteristic degradation in the medium (Pat. No. 5, 539, 588; Col. 2, L. 12-19).

Regarding Claim 7, the combination of Sugawara et al., Bliss et al. and Sawaguchi et al. teaches all the limitations of Claim 6. The combination further teach wherein modifying the selected equalization target for the channel comprises changing the equalization target to form a new target that does not have the spectral null (Col. 3, L. 34-52 of Sawaguchi et al. Sawaguchi et al. teach a magnetic recording/reproducing apparatus in which it selects the next to the lowest spectral null constraint.).

Regarding Claims 8, 9 and 10, the combination of Sugawara et al., Bliss et al. and Sawaguchi et al. teaches all the limitations of Claim 7, respectively. The combination further teach wherein modifying the equalization target for the channel comprises sequentially adjusting single terms, increasing terms and exchanging pairs of terms in the equalization target for the channel (Col. 9, L. 10-25 of Sugawara et al. wherein it teaches the modification of the tap coefficients in the medium in order to adapt to the chosen target. It is obvious to a person of ordinary skill in the art to know that when modifications of the tap coefficients are being employed, all these different cases could arise and can be employed if by doing so it guarantees a reduction of error in the equalized signal being processed by the read back channel.).

4. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugawara et al. and Bliss et al. and further in view of Sridharan et al. (*"A 110 MHz 350mW 0.6μ CMOS 16-State Generalized-Target Viterbi Detector for Disk Drive Read Channels"*).

Regarding Claim 11, the combination of Sugawara et al. and Bliss et al. teach all the limitations of Claim 1. Sugawara et al. does not explicitly teach wherein "separately identifying an equalization target for each of a set of heads; counting the number of times each equalization target was identified; and selecting the equalization target that was identified for the most heads

as the equalization target for the channel". However, Sridharan et al. does teach that an adaptive equalization technique as claimed in which it can be further be employed in a plurality of heads (Page, 367, 1st Column, Second Paragraph). It would have been obvious to a person of ordinary skill in the art, at the time the invention was made, to modify Sugawara et al.'s invention with the teaching of Sridharan et al. in order to be able to extract the error signal for LMS adaptation.

Regarding Claim 12, the combination of Sugawara et al., Bliss et al. and Sridharan et al. teach all the limitations of Claim 11. The combination further teaches separately identifying an equalization target for each of a set of head/zone pairs and selecting the equalization target that was identified for the most head/zone pairs as the equalization target for the channel (Page, 367, 1st Column, Second Paragraph of Sridharan et al.).

5. Claims 15-18, 22 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugawara et al. in view of Cideciyan et al. (US Patent No. 6, 377, 635).

Regarding Claim 15, Sugawara et al. teach Sugawara et al. teach a method to select out of a plurality of targets for the best metric for equalization as claimed (Col. 5, L. 14-31). However, Sugawara et al. does not explicitly teach wherein the targets have to satisfy a spectral null (Although Sugawara et al. does teach that the coding in the medium has to contain a amount of zeros', which is also referred to as a null in the signal, in Col. 11, L. 22-43.). Cideciyan et al. does teach targets chosen by a ACS circuit in a Viterbi detector being modified in a channel in order to minimize or no longer satisfy a spectral null (See Col. 3, L. 23-43 of Cideciyan et al.). It would have been obvious to a person of ordinary skill in the art, at the time the invention was made, to modify Sugawara et al.'s invention with the teaching of Cideciyan et al. in order to

provide a method for implementing high-speed and area efficient architectures for Viterbi detection of generalized partial-response signals.

Method claim (22) is drawn to the method of using the corresponding method claimed in claims (15). Therefore method claim (15) corresponds to method claim (22) and is rejected for the same reasons of obviousness as used above.

Regarding Claim 16, the combination of Sugawara et al. and Cideciyan et al. teaches all the limitations of Claims 15, respectively. The combination further teach wherein the modifying the equalization target for the channel to improve the measure of the goodness metric (Col. 5, L. 14-31 of Sugawara et al., wherein it teaches choosing the best metric to diminish the error.).

Regarding Claims 17 and 25, the combination of Sugawara et al. and Cideciyan et al. teaches all the limitations of Claims 16 and 22, respectively. The combination further teach wherein modifying the equalization target for the channel comprises sequentially adjusting single terms, increasing terms and exchanging pairs of terms in the equalization target for the channel (Col. 9, L. 10-25 of Sugawara et al. wherein it teaches the modification of the tap coefficients in the medium in order to adapt to the chosen target. It is obvious to a person of ordinary skill in the art to know that when modifications of the tap coefficients are being employed, all these different cases could arise and can be employed if by doing so it guarantees a reduction of error in the equalized signal being processed by the read back channel.).

Regarding Claim 18, the combination of Sugawara et al. and Cideciyan et al. teaches all the limitations of Claim 15. The combination further teach wherein locating an initial equalization target that provides a best goodness measure comprises locating an equalization

target that generates the fewest parity errors in the data produced by the channel (Col. 2, L. 25-40 of Sugawara et al.).

6. Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugawara et al. and Cideciyan et al. as applied to claim 15 above, and further in view of Sridharan et al. (*IEEE Transactions on Solid-State Circuits*, Vol. 35, No. 3, March 2000).

Regarding Claim 20, Sugawara et al. and Cideciyan et al. teach all the limitations of Claim 15. Sugawara et al. does not explicitly teach wherein "separately identifying an equalization target for each of a set of heads; counting the number of times each equalization target was identified; and selecting the equalization target that was identified for the most heads as the equalization target for the channel. However, Sridharan et al. does teach that an adaptive equalization technique as claimed in which it can be further be employed in a plurality of heads (Page, 367, 1st Column, Second Paragraph). It would have been obvious to a person of ordinary skill in the art, at the time the invention was made, to modify Sugawara et al.'s invention with the teaching of Sridharan et al. in order to be able to extract the error signal for LMS adaptation.

Regarding Claim 21, the combination of Sugawara et al., Cideciyan et al. and Sridharan et al. teach all the limitations of Claim 15. The combination further teaches separately identifying an equalization target for each of a set of head/zone pairs and selecting the equalization target that was identified for the most head/zone pairs as the equalization target for the channel (Page, 367, 1st Column, Second Paragraph of Sridharan et al.).

***Allowable Subject Matter***

7. Claim 14 is allowed.

8. The reasons for allowance for Claim 14 are in the prior Office Action dated 3/31/05.

9. Claims 13 and 19 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. Regarding Claims 13 and 19, the reasons for allowable subject matter are found in the Office Actions dated 03/31/05 and 06/30/2005, respectively.

***Response to Arguments***

11. Examiner acknowledges that Claims 4, 6, 23 and 24 have been cancelled by the Applicant in the Amendment dated 06/06/05.

12. Applicant's arguments with respect to claims 1, 2, 3, 5, 7-12, 22 and 25. have been considered but are moot in view of the new ground(s) of rejection due to the newly amended Claims.

13. Applicant's arguments with respect to claims 15-21 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Glenda P. Rodriguez whose telephone number is (571) 272-7561. The examiner can normally be reached on Monday thru Thursday: 7:00-5:00; alternate Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Hudspeth can be reached on (571) 272-7843. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

gpr
Aug 9, 2005.

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